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CIVIL AVIATION TRAINING IN BRAZIL

ABSTRACT

This paper presents information on civil aviation training in Brazil. It starts by explaining the importance of civil aviation activities in that country which has continental dimensions (8,500,000 Km2), about 2,000 airdromes (800 public and 1,200 private airfields), rapid growing population (161.8 million people) and high social and economic growth. The aviation development is also shown in terms of historical data on fleet composition and size (over 10,000 aircraft), on air passengers (22.4 billion Pax.Km) and cargo (590 million Ton.Km) transportation demand, on the number of certified pilots and other professionals (more than 50,000), on the existence of flight schools (over 300) and on the offer of related courses in universities.

An overview of the organizational structure of the Brazilian Department of Civil Aviation is shown emphasizing governmental training institutions, its regulatory policies and guideline documents for supervision, inspection and certification. In particular, a discussion is provided on the major role played by the Institute of Civil Aviation and the Institute of Flight Protection in the technical and professional instruction, since they offer specific courses, and carry out studies and research, as well as supervise and coordinate civil aviation training activities.

Finally, some forecasting data on the civil aviation training needs to support expected future annual increments in the Brazilian Civil Aviation System is presented.

THE IMPORTANCE OF CIVIL AVIATION IN BRAZIL

Brazil is a country of continental dimensions, with an area of 8,500,000 Km^2. When compared with the United States of America, which has an area of 9,372,614 Km^2, it is possible to better understand its needs in terms of air transport. However, the nine largest US air carriers have flown together in domestic flights during 1997 more than 591 billion passengers-Km, while all the Brazilian carriers have just flown 17.6 billion passengers-Km.

On the other hand, Brazil is the biggest country in South America with a rapid growing population of almost 162 million people,

according to the latest forecasting (1997) made by the Brazilian Institute for Statistics and Geography - IBGE, evolving from 144 million in 1990, and almost doubled its population since 1970. (IBGE – 1997).

In addition, Brazil has shown a high rate of economic development that tripled its GNP in the last eighteen years corresponding to an annual average increase of 6.5%. During the same period the air transport indicators for passengers (Pax.Km) and cargo (Ton.Km) more than doubled while the number of aircraft nearly doubled as well. This indicates the country's economic potential. If today's figures are compared with 1970, the average growth rates will be even higher.

Table 1 presents Brazilian Historical Data which can give an idea of the intense development which Brazil has been going through over the last three decades.

Table 1**: Brazilian Historical Data**

Year	GNP	Population	Pax.Km	Cargo (Ton.Km)	Number of Aircraft
	(US$ billion)	(million)	(billion)	(million)	
1970	45.0	93.1	2.0	40.4	1,873
1975	137.3	106.1	5.1	128.5	3,350
1980	250.3	118.6	9.6	253.2	5,355
1985	210.8	131.6	11.0	441.2	6,461
1990	463.8	144.1	15.2	511.7	7,686
1995	707.4	155.3	15.9	625.8	9,343
1997	804.1	159.6	17.6	577.9	9,871
1998	776.3	161.8	22.4	590.0	10,169

Source: Brazilian Institute for Statistics and Geography - IBGE
Getúlio Vargas Foundation
Brazilian Department of Civil Aviation

Presently, there are 712 public and 1,262 private airfields in Brazil scattered around the whole country which serve the aircraft traffic. The government owned company INFRAERO, which runs the largest 67 airports in the country, was responsible for 63.8 million passengers and 3.4 million ton. of cargo handled in 1997.

Civil aviation activities in Brazil plays an important role supporting social and economic development efforts. Likewise, the development of civil aviation has also evolved very rapidly which can be further clarified when looking at the specific aviation sector indicators, such as registered aircraft, fleet composition, and the number of certified pilots.

Thus, the figures shown on Chart 1 pointed out how the number of registered aircraft have increased

from 1993 to this year, representing an annual average growth rate of 2.7 %. In terms of fleet composition the latest figures show a total of 518 jet aircraft, 1,190 turbo propelled, 8,236 piston and 305 gliders. In particular, it should be mentioned that, according to the *ICAO Statistical Yearbook – 1998 (Doc 9180/22)*, the general aviation aircraft in Brazil represents the third largest fleet in the world, only behind the United States and Canada.

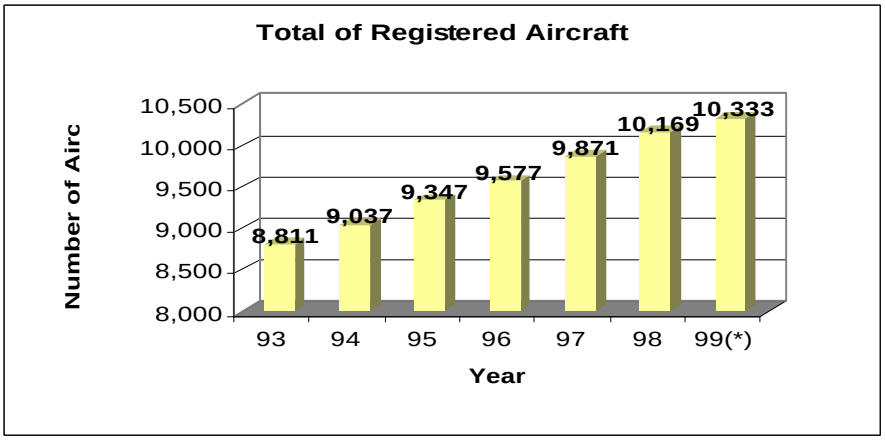


Chart 1: Total Registered Aircraft

Source: Brazilian Department of Civil Aviation – Technical Subdepartment

In the above mentioned *ICAO Statistical Yearbook*, the number of certified pilots working in the sector shows that Brazil still holds the third position, only behind the United States and Germany. The most recent data indicates that there are 56,734 certified pilots in the country, a number which is continuously growing through courses offered by more than 300 flight schools as well as four Universities which have lately been involved in the field of aviation.

In this environment the Department of Civil Aviation (DAC) and the Directorate of Electronics and Flight Protection (DEPV), two specialized agencies within Aeronautical Command and under the Ministry of Defense, are responsible for all civil aviation matters in Brazil. Each of these agencies have in its own structure and organization. The Institutes in charge of training and instruction are the Institute of Civil Aviation (IAC) and the Institute of Air Navigation Services (IPV).

THE STRUCTURE OF THE BRAZILIAN CIVIL AVIATION SYSTEM

The Department of Civil Aviation (DAC) is the central agency of the Civil Aviation System under the Aeronautical Command which

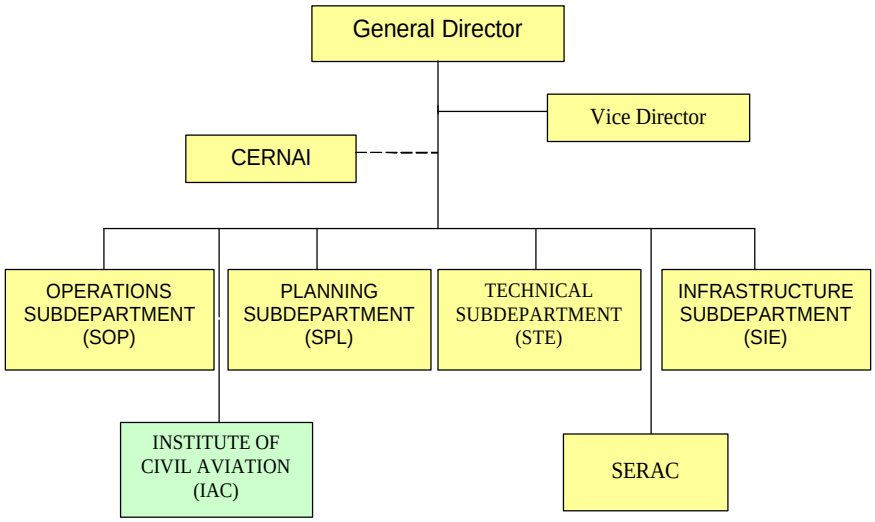
composes, together with the Navy and Army Commands, the Ministry of Defense.

DAC responsibilities are carried out by its Subdepartments, the Commission for Studies Related to International Air Navigation (CERNAI), Regional Civil Aviation Services (SERAC) and the Institute of Civil Aviation. These responsibilities include:

- the orientation, incentive and support to professional development and technical training of personnel;
- the orientation, coordination and control of public and private airports and aeronautical infrastructure operation, including the need for support services to air navigation;
- the orientation and control of air transportation services and other activities of public and private civil aviation;
- the coordination and regulatory orientation for the operation of the civil aviation System
- the planning and elaboration of budget proposals for annual programs necessary to civil aviation activities.

DAC's organizational structure is shown below.

DEPARTMENT OF CIVIL AVIATION



The four Subdepartments and the other organizations are in charge of the following attributions:

- Operations Subdepartment (SOP): Issues related to air traffic, investigation and prevention of aeronautical accidents and security of civil aviation;
- Planning Subdepartment (SPL): Issues related to commercial air services, air

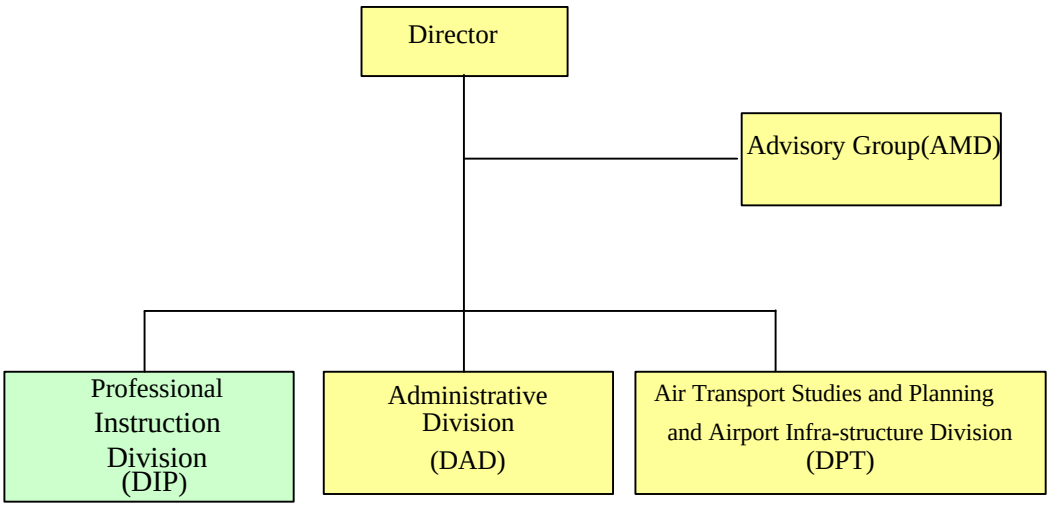
transport statistics and its economical/financial affairs;

- Technical Subdepartment (STE): Issues related to aircraft, airworthiness, maintenance, aviation clubs, flight sports and aircrew licensing, as well as periodical aviation personnel checks;
- Infrastructure Subdepartment (SIE): Issues related to airports and air navigation fares and charges, airport infrastructure and related programs and projects;
- CERNAI: study, orientation and coordination of subjects related to international air transportation agreements;
- SERAC: supervision of the activities related to civil aviation in different regions of Brazil in coordination with the Regional Air Commands (COMAR);
- Institute of Civil Aviation (IAC): Coordination of professional instructional activities and studies related to air transport and airport infrastructure planning.

THE INSTITUTE OF CIVIL AVIATION AND ITS TRAINING ACTIVITIES

The Institute of Civil Aviation (IAC), was created in June 27, 1986, under the DAC. IAC is divided into one Advisory Group and three Divisions with their respective sectors as seen on the organizational chart below.

INSTITUTE OF CIVIL AVIATION



The Division of Professional Instruction (DIP) is in charge of overseeing all training activities for Civil Aviation personnel. These responsibilities involve research, planning, regulation and supervision of the public and private educational organizations in the Civil Aviation System. The objective of this Division is to improve professional skills of human resources in the Brazilian Civil Aviation.

The activities conducted by DIP cover several areas which are: Educational Training Advisory; Aviation Manual Approval, Regulation Proposal; Aviation Course Planning and Research; Professional Instruction and Course Coordination; School and Course Certification; and Educational Supervision of Pilot Schools.

IAC also offers and develops a number of courses in its own facilities on different aspects of civil aviation. These courses are elaborated aiming at maintaining a high level of qualification among professionals in the civil aviation system. The courses are directed to a national public with the objective of updating the System's personnel making it compatible with today's technology. Some of the courses are offered in an international level to Portuguese speaking African countries and Latin America region which are included in the ICAO course catalogue.

At present, there are seventeen courses being offered directly by IAC as shown on table 2.

Table 2: IAC Courses and Attendance

COURSE	Number of Students				
	1995	**1996**	**1997**	**1998**	**1999**
Introduction to the Civil Aviation System	63	24	36	16	31
Pilot Flight Examiner	-	-	26	90	45
Pilot Flight Inspector	162	103	113	36	22
Technical Staff Inspector	32	-	-	-	16
Oral Exposition Practice	78	13	42	15	14
Aircraft Technical Inspection					
Civil Aviation Supervisor	40	115	71	39	68
Maintenance and Airworthiness – Technical Data and Records	-	-	-	-	40
Airline Security - Protection Against Illicit Acts	-	-	22	11	18
Air Transport of Dangerous Goods	-	-	-	-	19
Airport Infrastructure Charges	43	65	102	31	16
Air Transport Planning	21	09	22	17	22
Airport Planning	22	13	-	19	*
Airport Security – Protection Against Illicit Acts	79	38	46	25	*
Urban Planning Around Airports	-	21	22	-	*
The Airport and the Environment	26	19	22	12	*
Aircraft Noise Monitoring (Trainair method)	13	10	10	11	*

* - 1999 Courses that have not been taught yet

International course

The courses offered by flight schools and other institutions are guided by the IAC, through course manuals such as:

- Flight crew – steward(ess)
- Flight operations - dispatch
- Flight instructor – aircraft
- Aircraft maintenance – engine
- Aircraft maintenance – airframe
- Aircraft maintenance – avionics
- Private pilot – aircraft
- Private pilot – helicopter
- Commercial pilot – aircraft
- Commercial pilot – helicopter
- Airline pilot – aircraft
- Airline pilot – helicopter
- Crop-dusting pilot – airplane
- Air transport auxiliary services
- Instrument Flight Rules (IFR)
- Aircraft Flight Instructor (INVA)

The impact of the rapid modernization and the use of new technologies in air transport requires a constant updating of the human resources working in the system in order to make it efficient and safe. The fast growth of civil aviation has been pushing the demand for skilled professionals, thus increasing the need for aviation schools in the different Brazilian regions. These schools are supervised by IAC with the objective of keeping up the instruction quality and ensuring the preparation of qualified personnel in the many different areas of the Civil Aviation System.

In this environment, IAC together with the Regional Civil Aviation Services (SERAC), analyse the general condition of those schools applying for certification at DAC. In this analysis the compliance with regulation and manual requirements are verified in order to issue certification.

After certification, a follow-up of the schools and other training institutions is regularly performed to check if the manuals and regulation documents are being properly followed.

With the growth of the employment market for civil aviation, the number of schools involved with education on these matters has increased considerably. Nowadays, there are 302 institutions offering courses related to civil aviation, including Universities which have become interested in offering undergraduation courses on related subjects. These Universities and its courses are exhibited in Table 3:

Table 3: Undergraduation Courses in Civil Aviation

UNIVERSITY	COURSE
Pontifical Catholic University of Rio Grande do Sul (PUC – RS)	Commercial Pilot – aircarft Airline Pilot – aircraft
Federal University of Pernambuco (UFPE)	Flight Crew – Steward(ess)
Catholic University of Goiás (UFGO)	Private Pilot – aircraft Commercial Pilot – aircraft Airline Pilot – aircraft

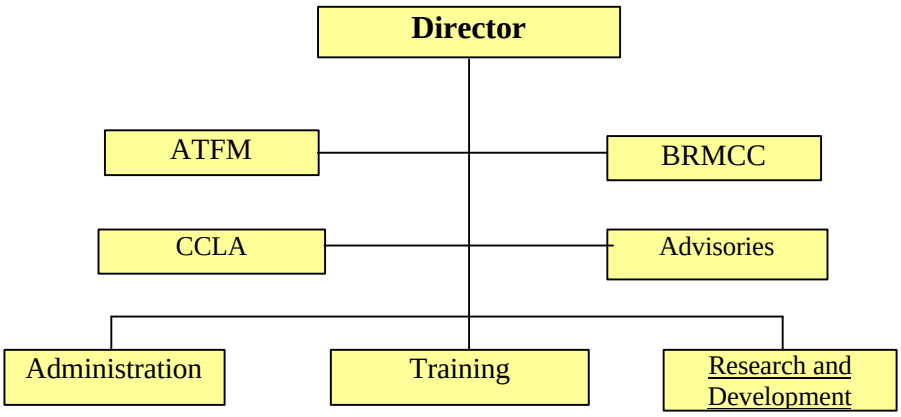
THE INSTITUTE OF AIR NAVIGATION SERVICES (IPV)

Created in 1972 as a "Center for Technical Updating" (CAT), it later on reached the status of an Institute in 1978. The Institute of Air Navigation Services (IPV) is an organization under the Directorate of Electronics and Flight Protection, and is responsible for human resources training and research and development activities for Brazilian Airspace Control System (SISCEAB).

Further to these activities related to training and research, IPV is also actively supporting the implementation of the Brazilian Air Traffic Flow Management Center (ATFM), the SAR Mission Coordination Center (BRMCC – a segment of COSPAS/SARSAT) and the Aeronautical Climatory Center (CCLA). After being implemented, these Units will constitute the Control Center for the SISCEAB.

IPV is in the Airspace Technical Center campus, in São José dos Campos, São Paulo. An organizational chart of IPV is shown below.

INSTITUTE OF AIR NAVIGATION SERVICES



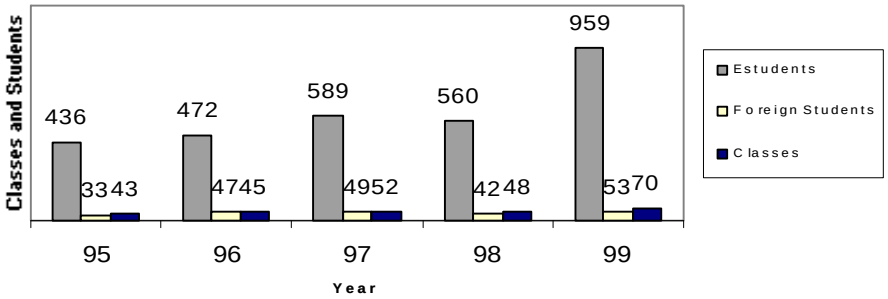
Activities Developed by the Training Area

In the training area IPV develops and delivers many courses in the fields of electronics, communications, ATS, AIS, meteorology and management (Table 4). At present, the training area coordinates 28 courses that take place several times during the year, in an average of 51 groups and 649 students each year (Chart 2). The target public aimed at these courses is the SISCEAB personnel. However, Portuguese speaking countries from the Car/SAM Region and Africa have also used IPV to enhance their expertise level and to perform training of their personnel. Up to this moment 18,500 foreign students have attended to IPV.

Table 4: IPV's Courses

AREA	CODE	NAME
ELECTRONICS AND TELECOMMUNICATIONS	CB-07	Microprocessors Basics
	CB-08	Data Communications Basics
	CB-09	ILS Basic Course
	CB-14/114	Radar Maintenance Basics
	CB-16/116	Electronics and Telecommunications
	CB-37	SISCEAB Maintenance Inspector
	MN-31	VOR585B Maintenance
	MN-32	DME596B Maintenance
	MN-33	VHF/AM200 Stations Maintenance
	MN-34	Personal Computers Maintenance and Support
AIR TRAFFIC CONTROL	OP-16	VHF-DF HOMING Operations
	OP-17	Terminal Area Radar Controller
	OP-18	En Route Radar Controller
	OP-30	Air Traffic Controller (ab-initio)
	OP-90	ATC Watch Supervisor
AERONAUTICAL INFORMATIONS	CG-24	AIS Unit Supervisor
	OP-20	Aeronautical Information Expert
SEARCH AND RESCUE	OP-06	RCC Controller
	OP-111	SAR Coordinator
SUPPLY	CB-15	Supply Basics
	OP-85	SAGA Operational
FLIGHT INSPECTION	OP-27	Flight Inspection Systems Operation
	OP-126	Flight Inspector – Theory
METEOROLOGY	OP-132	Military Meteorological Center Operation
	OP-178	Aeronautical Meteorology – Post Graduate Course
MANAGEMENT	CG-112	SISCEAB Activities Management

Chart 2: IPV's Statistics Data on Courses and Students



Activities Developed by the Research and Development Area

In the fields of research and development, IPV carries out projects for simulators, tools for supporting decision taking, operations support and administrative systems (Table 5). IPV also develops air traffic studies aiming at the validation of new air navigation procedures and new airspace structure.

The simulators developed by IPV are made available to the States in the CAR/SAM region through technical cooperation agreements. Ten (10) States have already benefited from this process and today count on simulators developed by IPV. Table 6 shows the most important simulators developed by IPV.

Table 5: IPV in Course Projects

PROJECT	OBJECTIVE
ATFM	Develop tools to support the decision taking for the management of air traffic flow.
SRBC 3.0	Adapt the SISAT (Terminal Area Simulation System) and a network environment based on personal computers.
BDC	Develop a data base on climate information.
TWR-3D	Develop a TWR 3D simulator.
SIPAR 2000	Develop a simulator for PAR 2000
SISAT 4.0	Implement in the SISAT simulator (Terminal Area Simulation System) the recording and reproduction procedures of statistical data.
SIREVOX	Develop a voice recognition and synthesis system prototype for use in simulators.
SIASA	Develop an automated airport slot allocation system which allows remote access by phone or internet.
Simulation Framework	Develop an object oriented framework for use in simulation applications

Table 6: Main Simulators Developed by IPV

Simulator	**Application**
SISAT	Terminal Area Simulation System. A large capacity real-time and high-fidelity simulator. It is used for: - Training and refreshment of air traffic controllers which work or will work in a APP; - new air traffic procedures studies; and - new airspace configuration studies.
SRBC	Low Cost Radar Simulator. Based on two personal computers, in its reduced version, or personal computers in network with a unix workstation, in its complete version. Can be used for: - air traffic controllers updating and training which work or will work in an APP; - studies related to new air traffic procedures; and - studies related to new airspace configurations.
SICAD	Airdrome Control Simulator. Composed by two personal computers, can be used in the training of air traffic controllers who will work in a TWR.
SIPAR	Precision Radar Simulator. Applied on the training of PAR radar controller.
SIREC	VHF-DF Simulator. It is a simulator made up of two personal computers, applied for the training of air traffic controllers on this type of equipment.

BRAZILIAN CIVIL AVIATION TRAINING REQUIREMENTS

The growth of Civil Aviation creates a demand for training enhancements in several education fields. The forecast for Brazilian Civil Aviation System needs in terms of human resources show that in the period 2000-2004, 37,477 professionals should be trained as described in Table 7. These forecasts also indicate that more than 6.6 thousand professionals will need to be trained in 2000, reaching a total of 8,4 thousand in 2004.

Table 7**: Brazilian Civil Aviation Training - 2000/ 2004**

Fields of Training	**Human Resources**					
	2000	**2001**	**2002**	**2003**	**2004**	**Total**
Air Transport Economics	55	59	63	67	72	316
Aircraft Maintenance – Airframe Systems	100	106	113	120	128	567
Aircraft Maintenance – Powerplant Systems	100	106	113	120	128	567
Aircraft Maintenance – Airframe and Powerplant Systems	100	106	113	120	128	567
Aircraft Maintenance – Aircraft Instruments	100	106	113	120	128	567
Aircrat Structural Repair Techniques	100	106	113	120	128	567
Aircraft Maintenance – Avionics	100	106	113	120	128	567
Airwothiness	12	13	14	15	16	70
Airport Engineering	10	11	12	13	14	60
Aircraft Maintenance – Electrical	23	25	27	31	33	139
Aircraft Maintenance – Pavement	14	15	16	17	18	80
Other Courses (Mechanics and Computer Sciences	35	38	41	44	47	205
Airport Management – Administration	35	38	41	44	47	205
Airport Management – Commercial	35	38	41	44	47	205
Aviation Security (AVSEC)	42	45	48	51	55	241
Airport Management – Technical	35	38	41	44	47	205
Safe Transport of Dangerous Goods by Air	44	47	50	53	57	251
Instructional Techniques - Basic	17	18	19	20	21	95
Fixed Wing Aircraft – Private Pilot Licence	1,283	1,360	1,441	1,528	1,620	7,232
Fixed Wing Aircraft – Commercial Pilot Licence	756	802	851	903	958	4270
Fixed Wing Aircraft – Commercial Pilot Licence IFR	752	797	845	895	949	4238
Helicopter – Private Pilot Licence	269	286	304	323	343	1525
Helicopter – Commercial Pilot Licence	171	182	193	205	218	969
Helicopter - Flight Instructor Rating	279	296	314	333	373	1595
Airline Transport Pilot Licence - Theory	475	503	566	600	636	2780
Pilot Flight Examiners/Check Captains	141	150	159	169	180	799
Flight Engineer	12	13	14	15	16	70
Airline Cabin Services	1,485	1,574	1,669	1,770	1,877	8,375
Airline Flight Operations Officer	26	28	30	32	34	150
Total	6,606	7,012	7,477	7,936	8,446	

FINAL COMMENTS

The complex and dynamic activities involved in Civil Aviation system brings many challenges to the Brazilian Government, specially in a country with continental dimensions and large number of aircraft, airports, pilots and other support personnel.

Additionally, Brazil has been going through a significant economic growth, with its GNP increasing very rapidly during the last decades. As a consequence, great enhancements are also required in almost all education fields in the civil aviation in order to cope with the increase in aircraft, passengers and cargo movements.

The development of Brazilian civil aviation is clear when looking at the ICAO Statistical Yearbook (1998). It indicates that Brazil is in the third position on general aviation aircraft and certified pilots, reinforcing the importance of Brazilian civil aviation in the global environment.

To support Civil Aviation growth, education and training efforts must be compatible with the sector's human resources requirements. To face this issue, particularly in today's world reality, the Civil Aviation System needs to have adequate and qualified personnel in order to fulfill its potential.
It is important to emphasize that with the globalization wave there is a constant need for training and updating professionals in schools with high educational standards both in Brazil and abroad.

Civil aviation training task is a major endeavor which count on the IAC and IPV's efforts to provide constant training for human resources in the Brazilian System.

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